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 **$^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$     1973Fo11**

- 1971Al09:  $^{16}\text{O}(\text{n},\gamma)$ , E=420 keV; measured  $\sigma(E;E\gamma)$ .  $^{17}\text{O}$  resonances deduced level-width.
- 1973Fo11:  $^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$  E=0.6-4.3 MeV; measured  $\sigma(E)$ .  $^{17}\text{O}$  deduced levels, J,  $\pi$ ,  $\Gamma$ .
- 1988Ki02:  $^{16}\text{O}(\text{n},\gamma)$ , E≈resonance; measured  $E\gamma$ ,  $I\gamma$ .  $^{17}\text{O}$ , deduced resonance  $\Gamma\gamma$ . Valence capture model.
- 1992Ig01:  $^{16}\text{O}(\text{n},\gamma)$ , E=280,434 keV; measured  $\sigma(E,E\gamma)$  at  $\theta=125^\circ$ .  $^{17}\text{O}$  deduced resonance,  $\Gamma\gamma$ . Natural target. Valence-capture model.
- 1994Hu21:  $^{16}\text{O}(\text{n},\gamma)$ , E=7-14 MeV; measured  $\sigma(\theta)$  vs E; deduced  $\sigma(\gamma,n_0)$ .  $^{17}\text{O}$  deduced pygmy resonance characteristics.
- 1996Na27:  $^{16}\text{O}(\text{n},\gamma)$ , E=10-300 keV; measured  $E\gamma$ ,  $I\gamma$ , capture  $\sigma$  at some neutron energies. Implications for primordial and stellar nucleosynthesis.
- 2000OhZY:  $^{16}\text{O}(\text{n},\gamma)$ , E≈150-550 keV; measured  $\sigma$ .
- 2020Na34:  $^{16}\text{O}(\text{n},\gamma)$ ,  $E_{\text{ave}} \approx 157$ -556 keV; measured  $\sigma$ , deduced astrophysical reaction rates.

**Theory:**

- 2007AsZY:  $^{16}\text{O}(\text{n},\gamma)$ , E=low; calculated capture cross sections.
- 2010YaZW:  $^{16}\text{O}(\text{n},\gamma)$ , E=low; calculated intrinsic nuclear densities for two configurations.
- 1997Li10:  $^{16}\text{O}(\text{n},\gamma)$ , E<600 keV; calculated  $\sigma(E_n)$ ; deduced influence of scattering potential depth. Consistent direct-semidirect model.
- 2001Du12:  $^{16}\text{O}(\text{n},\gamma)$ , E(cm)≈10-300 keV; calculated  $\sigma$ . Generator coordinate method, cluster model. Comparisons with data.
- 2005Du20:  $^{16}\text{O}(\text{n},\gamma)$ , E(cm)≈10-300 keV; calculated  $\sigma(E)$ . Microscopic two-cluster model, generator coordinate method, comparison with data.  $^{17}\text{O}$ ; calculated levels, J,  $\pi$ .
- 2007AsZZ:  $^{16}\text{O}(\text{n},\gamma)$ , deduced S-factors using ANC values from transfer reactions.
- 2008Ch05:  $^{16}\text{O}(\text{n},\gamma)$ , E=0.01-10 MeV; calculated neutron capture cross sections.
- 2008YaZY:  $^{16}\text{O}(\text{n},\gamma)$ , E<0.6 MeV; calculated cross sections using the Cluster Orbital Shell Model to describe the nuclear structure.
- 2009Wa17:  $^{16}\text{O}(\text{n},\gamma)$ , E(cm)<1 MeV; analyzed  $\sigma$ , spectroscopic factors and other parameters for nonresonant neutron capture using simple polynomials obtained from Taylor expansions. Comparison with experimental data.
- 2009Ya03:  $^{16}\text{O}(\text{n},\gamma)$ , E(cm)<10 MeV; calculated cross sections.
- 2010Hu11:  $^{16}\text{O}(\text{n},\gamma)$ , E(cm)<2 MeV; calculated binding energies,  $\sigma$ , S-factors, spectroscopic factors. Single-particle potential model.
- 2010Pr07:  $^{16}\text{O}(\text{n},\gamma)$ , E=0.001-1 MeV; calculated Maxwellian-averaged  $\sigma$  and astrophysical reaction rates using evaluated neutron libraries; deduced ENDF/B-VII.0, JENDL-3.3, JEFF-3.1, ENDF/B-VI.8 neutron-induced reaction  $\sigma$  deficiencies. Comparison with experimental data and KADONIS.
- 2010Sp01:  $^{16}\text{O}(\text{n},\gamma)$ , E not given; calculated asymptotic normalization constants (ANC) as a function of binding energy for subthreshold bound states using the analytic continuation of the scattering (S) matrix in the complex wave-number plane.
- 2011Ch57:  $^{16}\text{O}(\text{n},\gamma)$ , E=30 keV; calculated Maxwellian-averaged  $\sigma$  using ENDF/B-VII.1 evaluated neutron library. Comparison with ENDF/B-VII.0 and KADONIS values.
- 2012Pr13:  $^{16}\text{O}(\text{n},\gamma)$ , E<20 MeV; calculated Maxwellian-averaged  $\sigma$ , astrophysical reaction rates, neutron thermal  $\sigma$ , Westcott factors, resonance integrals and their uncertainties using evaluated neutron libraries; deduced ENDF/B-VII.1, JEFF-3.1.2, JENDL-4.0, ROSFOND 2010, CENDL-3.1, EAF 2010 neutron-induced reaction  $\sigma$  deficiencies. Comparison with experimental data, KADONIS and Atlas of Neutron Resonances.
- 2012Xu09:  $^{16}\text{O}(\text{n},\gamma)$ , E=1-10000 keV; calculated total neutron direct capture cross sections. Comparison with experimental data.
- 2013Du15:  $^{16}\text{O}(\text{n},\gamma)$ , E<1 MeV; calculated  $\sigma$ . Modified cluster model with the classification of orbital states according to Young tableaux, comparison with available data.
- 2013Du16:  $^{16}\text{O}(\text{n},\gamma)$ , E<1 MeV; calculated  $\sigma$ , phase shifts. Young diagrams, potential cluster model.
- 2013He11:  $^{16}\text{O}(\text{n},\text{n}),(\text{n},\gamma)$ , E<20 MeV; calculated JENDL-4.0 covariances. Comparison with available data.
- 2014Xu09:  $^{16}\text{O}(\text{n},\gamma)$ , E=0.001-10 MeV; calculated total capture  $\sigma(E)$  for three processes of compound-nucleus capture (CNC), pre-equilibrium capture (PEC), and direct capture (DIC) using Hauser-Feshbach model, the exciton model, and potential model, respectively, and Compared with experimental data. Z=8-100, N=10-180; calculated total neutron-capture cross sections and astrophysical reaction rates using TALYS code for about 8000 nuclei. Impact of the newly determined reaction rates on the r process abundances.
- 2015Sa01:  $^{16}\text{O}(\text{n},\text{n}),(\text{n},\text{n}'),(\text{n},\gamma)$ , E<20 MeV; analyzed available data; deduce  $\sigma$  uncertainties adjustments. Comparison with available data.
- 2015Zh13:  $^{16}\text{O}(\text{n},\gamma)$ , E<3 MeV; calculated  $\sigma(E)$  using nuclear structure information obtained from a covariant density functional theory as input for the FRESCO coupled reaction channels code; investigated impact of pairing, spectroscopic factors, and optical potentials on direct capture cross sections. Comparison with experimental data.
- 2016Mo23:  $^{16}\text{O}(\text{n},\gamma)$ , E<700 KeV; analyzed available experimental data from KADoNiS and REACLIB, ENDF/B-VII.1, JEFF-3.2, JENDL-4.0 evaluated libraries; deduced Maxwellian-averaged  $\sigma$ , reaction rates.
- 2018Br05:  $^{16}\text{O}(\text{n},\gamma)$ , E=30 keV; calculated Maxwellian-averaged  $\sigma$  using ENDF/B-VIII.0 evaluated neutron library. Comparison

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**$^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$     1973Fo11 (continued)**

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with ENDF/B-VII.1 and KADONIS values.

2020He19:  $^{16}\text{O}(\text{n},\gamma)$ ,  $E < 1$  MeV; analyzed contributions from single-particle resonances, evaluated astrophysical reaction rates and associated uncertainties for nucleosynthesis.

2021Zh26:  $^{16}\text{O}(\text{n},\gamma)$ , calculated direct capture, thermonuclear reaction rates for astrophysical applications.

See also ([2001Sh27](#)).

**$^{17}\text{O}$  Levels**

$\Gamma$ : From ([1973Fo11](#)) except where noted.

$E(\text{level})^{\dagger\ddagger}$	$J^\pi{}^{\dagger}$	$\Gamma^{\#}$	Comments
0	$5/2^+$		E(level), $J^\pi$ : from ENSDF database.
870	$1/2^+$		E(level), $J^\pi$ : from ENSDF database.
4544 10	$3/2^-$		E(level): from $E_{\text{res}}=426$ keV 10 ( <a href="#">1971Al09</a> ). $\Gamma_n=60$ keV 15, $\Gamma_\gamma<4.0$ eV ( <a href="#">1971Al09</a> ).
5216		<0.1 keV	E(level): not observed in $\sigma_t$ ( <a href="#">1973Fo11</a> ).
5697 2	$7/2^-$	3.4 keV	
5733 2	<i>a</i>	<1 keV	
5868 2	$3/2^+$	6.6 keV	
5939 4	$1/2^-$	32 keV	
6356 8	$1/2^+$	124 keV	
6862 2	<i>a</i>	<1 keV	
6972 2	<i>a</i>	<1 keV	
7165 3	$5/2^- @$	1.3 keV	
7202 10	$3/2^+$	280 keV	
7379 3	$5/2^+ @$	0.5 keV	
7382 3	$5/2^- @$	1.1 keV	
7559 20	$3/2^-$	500 keV	
7575		<0.1 keV	E(level): not observed in $\sigma_t$ ( <a href="#">1973Fo11</a> ).
7687 4	$7/2^-$	18 keV	
7958 8	$1/2^+$	90 keV	
7992 50	$1/2^-$	270 keV	
8060 8	$3/2^+$	85 keV	
8181 20	$1/2^- &$	69 keV	
8199 10	$3/2^- &$	52 keV	$\Gamma$ : deduced from ( <a href="#">1961Fo07</a> ).

$\dagger$  From ([1973Fo11](#)) except where noted.

$\ddagger$  Calculated from  $E(\text{level})=4143+(16/17)\times E_{\text{res}}$ .

$\#$  Uncertainties in widths  $\approx 0.1\Gamma$  for  $\Gamma > 3$  keV and  $\approx 0.3\Gamma$  for  $\Gamma < 3$  keV. The ([1973Fo11](#)) values have overlap with those given in  $^{16}\text{O}(\text{n},\text{n}),(\text{n},\text{n}')$ ; the uncertainties are given there to avoid duplication.

$@$  Assignment based on  $^{13}\text{C}(\alpha,\text{n})$  and  $^{16}\text{O}(\text{n},\text{n})$  ([1970Fo03,1957Wa46](#)), and  $^{13}\text{C}(\alpha,\text{n})$  ([1973Ba10](#)).

$\&$  Assignment based on  $^{13}\text{C}(\alpha,\text{n})$  ([1957Wa46](#)).

$a$   $J^\pi$ : not  $1/2^+$  ([1973Fo11](#)).

**$\gamma(^{17}\text{O})$**

$E_\gamma$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
3674	4544	$3/2^-$	870	$1/2^+$	$\Gamma_\gamma=1.64$ eV 31 ( <a href="#">1988Ki02</a> ); $\Gamma_\gamma=1.85$ eV 35 ( <a href="#">1992Ig01</a> )
4544	4544	$3/2^-$	0	$5/2^+$	$\Gamma_\gamma=1.59$ eV 31 ( <a href="#">1988Ki02</a> ); $\Gamma_\gamma=1.80$ eV 35 ( <a href="#">1992Ig01</a> )

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 $^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$     **1973Fo11**Level Scheme